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72-6

An Announcement of **Highway Safety Literature** ... A Bi-Monthly Abstract Journal

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THIS ISSUE CONTAINS:

HS-010 637 - HS-010 710
HS-800 525

U.S. Department of Transportation / National Highway Traffic Safety Administration

INTRODUCTION

Publications such as journal articles, proceedings, and research reports announced in *Highway Safety Literature* include some of the most recent additions to the collection of the NHTSA Scientific & Technical Information Service. Subject areas covered include all phases of highway, motor vehicle, and traffic safety, especially those encompassed by the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966.

Individual issues of *HSL* are numbered according to the year and the issue number within that year; thus, 71 designates the year and 1, 2, 3, etc. the individual issues. To aid the user in locating citations by the HS-number, the cover bears the inclusive entry number for each issue.

Entries in *HSL* are arranged according to the NHTSA Subject Category List shown in the Table of Contents. The list is a two-level arrangement consisting of five major subject fields subdivided into 59 subject groups. Documents related directly to the National Highway Traffic Safety Administration

(NHTSA) are announced in a separate section headed NHTSA DOCUMENTS and are numbered in five distinct series: NHTSA Accident Investigation Reports (HS-600 000 series), NHTSA Compliance Test Reports (HS-610 000 series), NHTSA Contractors Reports (HS-800 000 series), NHTSA Staff Speeches, Papers, etc. (HS-810 000 series), and NHTSA Imprints (HS-820 000 series). For NHTSA DOCUMENTS in series HS-600 000 and HS-610 000, individual full case reports are available for inspection at the National Highway Traffic Safety Administration. HS-800 000 series and HS-820 008 series are available for purchase from NTIS or GPO (see page ii). Although announced together in a separate section, these documents are also assigned specific subject categories for machine retrieval.

A document which contains a number of separate articles is announced as a complete volume in the subject category most applicable to it as a whole. Entries for the individual articles appear in their most specific subject category.

SAMPLE ENTRIES

Subject Category Array

NHSB Accession no..... HS-800 218 Fld. 5/21; 5/9
Title of document..... AN INVESTIGATION OF USED CAR
SAFETY STANDARDS-SAFETY
INDEX: FINAL REPORT. VOL. 6 -
APPENDICES G-L
Personal author(s)..... by E. N. Wells; J. P. Fitzmaurice; C. E.
Guilliams; S. R. Kalin; P. D. Williams
Corporate author..... Operations Research, Inc.
Collation.....
Publication date..... 1969 150p
Contract FH-11-6921
Report no. ORI-TR-553-Vol-6; PB-190
523
Abstract..... Appendices G-L to this study of used
car safety standards include: indenture
model diagrams for classes I-IV motor
trucks; degradation, wear, and failure
data for motor truck classes I-IV; and
safety index tables for classes I-IV
motor trucks.

Search terms; Wear; Trucks;
Failures; Used cars; Inspection
standards

HS-004 497 Fld. 5/19

AUTO THEFT-THE PROBLEM AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation . . . Published in *FBI Law Enforcement
Bulletin* v37 n12 p15-7 (Dec 1968)

Gives figures on the extent of the
auto theft problem and comments on
antitheft devices available now or in
the planning stage.

Search terms: Theft; Theft protec-
tion; Stolen cars

AVAILABILITY: NTIS

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* All Federal Motor Vehicle Safety Standards apply to passenger vehicles. An asterisk before a subject group indicates additional types of vehicles to which the indicated standards may apply.

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NOTE: Material published in Highway Safety Literature (HSL) is intended for the information and assistance of the motor vehicle and highway safety community. While brand names, equipment model names and identification, and companies may be mentioned from time to time, this data is included as an information service. Inclusion of this information in the HSL should not, under any circumstances, be construed as an endorsement or an approval of any particular product, course, or equipment by the U. S. Department of Transportation, National Highway Traffic Safety Administration.

Harry A. Feinberg
Managing Editor

**AVAILABILITY OF DOCUMENTS
AND
INSTRUCTIONS FOR ORDERING**

Articles and reports whose citations and abstracts appear in HSL are acquired from many sources, such as periodicals, journals, NHTSA Contractors' reports and NHTSA staff speeches, and other reports. Those reports other than NHTSA Contractors' reports and NHTSA generated reports and speeches (see introduction) are assigned a lower consecutive accession (HS-) number.

Department of Transportation personnel may borrow copies of publications announced in HSL from the NHTSA Technical Reference Division. Non-DOT Personnel, in the Washington, D.C. area, may borrow copies of publications for a 24-hour period only. Telephone (202) 426-2768. Government personnel in the Washington, D.C. area, use government ID phone 118-62768.

The names of the journals cited in HSL appear in italic type preceded by the word "Published in." The journal containing the article cited may be borrowed from most research and public libraries. Non-DOT personnel outside the Washington area should contact their company or agency libraries for assistance.

NHTSA Contractors' reports and other reports can usually be obtained as indicated under AVAILABILITY. However, there is no certainty that copies will be available for more than a limited period after a report is issued.

The more common availability sources are identified by symbols which are explained in the next column:

NTIS: National Technical Information Service, Springfield, Va. 22151. Order by accession number: HS, AD, or PB. Prepayment is required by NTIS coupon (GPO coupons are not acceptable), check or money order (made payable to the NTIS). PC (Paper copy; full size original or reduced facsimile) prices are \$3.00 up to 300 pages, \$6.00 for 301 to 600 pages, \$9.00 for 601 to 900 pages, and over 900 pages will be quoted on request. Surcharge is added for foreign orders. MF (microfiche approximately 4x6" negative sheet film; reader required) is \$0.95 per report.

GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Give corporate author, title, personal author, and report number. Prepayment is required by GPO coupon (NTIS coupons are not acceptable), check or money order (made payable to the Superintendent of Documents).

HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

NHTSA: National Highway Traffic Safety Administration, General Services Division, Washington, D.C. 20591 (Telephone (202) 426-0874). Give HS-No.

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by SAE report numbers. Prices given are list; discounts are available to SAE members and sometimes to libraries and U.S. Government Agencies. Prepayment is required; orders received without payment are subject to a \$1 handling charge.

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WHEN REQUESTING a document, to be absolutely sure you receive what you order, give the accession number (HS, PB, AD number) or report number (in cases such as an SAE document), title of report, and the personal or corporate author (whichever is cited). When requesting an HS-numbered document from NTIS, add DOT/ to the prefix HS-; example HS-800 000 should be ordered as DOT/HS-800 000.

1/0 ACCIDENTS

1/2 Injuries

HS-010 637 Fld. 1/2

TRAFFIC INJURIES OF THE PELVIS AT ST. VINCENT'S HOSPITAL, MELBOURNE

by Peter Ryan

Published in *Medical Journal of Australia* v1 p475-9 (27 Feb 1971)

8 refs

Seven hundred thirteen patients were admitted to St. Vincent's Hospital, Melbourne, in the 12 years from 1956 to 1967 with fractures and/or dislocations of the pelvis. The records of these patients were studied in order to discern the patterns of skeletal injury, the fate of those with traffic injuries of the pelvis, and the incidence of major damage to pelvic viscera.

Search terms: Pelvic injuries; Multiple injuries; Impact caused skeletal damage; Injury statistics; Fatality rates; Injury severity; Ruptures

HS-010 638 Fld. 1/2; 1/1; 4/3

MOTOR VEHICLE INJURY PREVENTION AND EMERGENCY HEALTH SERVICES. REPORT OF 1967 HEALTH PROGRAM ANALYSIS REVIEW GROUP FOR SELECTED DISEASE CONTROL PROGRAMS

Public Health Service

1967 116p refs

Benefit cost analysis is made of six programs: restraining systems for motor vehicle occupants; medical aspects of driver licensing and driver evaluation; motorcycle injury prevention; reduction of pedestrian injuries; decreasing the amount of driving exposure when the risk of accident involvement has been significantly increased by use of alcohol;

and improvement in emergency health services for motor vehicle occupants.

Search terms: Injury prevention; Fatality prevention; Safety programs; Accident prevention; Federal role; Benefit cost analysis; Emergency medical services; Driver license standards; Restraint system effectiveness; Program evaluation; Motorcycle safety; Drinking drivers; Driver intoxication; Accident risks; Epidemiology; Driver physical fitness; Medical factors; Accident costs; Injury costs

HS-010 639 Fld. 1/2; 5/20

THE EPIDEMIOLOGY OF SNOW-MOBILING INJURIES

by L. Allan Erskine

Published in *Journal of Trauma* v10 p804-6 (Sep 1970)

The injuries which happen in snowmobiling can be broken down in three categories: (1) injuries which are directly due to the construction of the snowmobile itself, i.e. scarf catching in the flywheel of the motor and strangling the driver, burns received from the motor; (2) injuries which are the result of the operation of the vehicle—severe neck injuries because the lights are placed very low and people go under electric cattle fences, "wishbone injuries" sustained when a driver's knee is sticking out beyond the side of the snowmobile and passes close to a fence or a tree and the victim is literally torn asunder, compression fractures of the lumbar vertebrae; (3) injuries which are the result of the failure of the mechanism: running out of gas and getting frostbitten. Still, snowmobiles are relatively safe when used with care and discretion.

Search terms: Snowmobile caused injuries; Snowmobile design; Freezing; Environmental factors; Neck injuries; Spinal fractures; Leg injuries; Impact caused skeletal damage; Multiple injuries

1/3 Investigation

HS-010 640 Fld. 1/3; 4/7; 2/8

ON THE EFFECTIVENESS OF STATISTICAL CONTROL CHART TECHNIQUES IN SELECTIVE ENFORCEMENT APPLICATIONS. FINAL REPORT

by Gary R. Fisher

California Univ. ITTE

1970 90p 5 refs

Report no. 70-12; PB-200 669

Sponsored in cooperation with the California Business and Transportation Agency and the U.S. Bureau of Public Roads.

Control chart techniques can assist operational personnel in detecting stable patterns among fluctuating accident rates. This study was conducted in part to examine the effect of motorcycle officer allocation upon traffic accidents in Los Angeles. Statistical tests and control charts were used on data from police enforcement beats, but difficulties such as confounding of enforcement effects and exposure effects led to inconclusive results. The techniques have utility in real-time allocation of ambulance services, police, manpower and accident investigation teams.

Search terms: Police traffic services; Traffic law enforcement; Manpower utilization; Law enforcement effect on accident rates; Accident risk forecasting; Accident rates; Accident statistics; Emergency medical services; Statistical analysis; Los Angeles; Accident investigation; Accident studies; Accident control charts; Decision making; Time of accidents

AVAILABILITY: NTIS

1/4 Locations

HS-010 641 Fld. 1/4; 2/4; 1/3

THE EFFECT OF RAMP TYPE AND GEOMETRY ON ACCIDENTS, 2ND ED.

by Richard A. Lundy

Calif. Dept. of Public Works

1966 70p

Prepared in cooperation with the Bureau of Public Roads.

In a study of 722 freeway ramps over a three year period, 1,643 accidents occurred. On-ramp accident rates were consistently lower than off-ramp accident rates; averages per million vehicles were 0.59 and 0.95 respectively. Correlations were found between accident rates and ramp type, relative grades, fixed objects, lengths of speed change lanes, safe entrance speeds at on-ramp noses, and off-ramp radii. Correlations were not found or were undetermined between accident rates and on-ramp curvature, ramp lighting, ramp traffic volumes, and ramp central angles.

Search terms: Accident factors; Accident location; Ramps; Cloverleaf interchanges; Freeways; Traffic volume; Road curves; Fixed objects; Environmental factors; Accident studies; Accident severity; Accident rates; Accident types; Traffic lanes; Speed patterns; California

1/5 Statistical Data

HS-010 642 Fld. 1/5

ACCIDENTAL DEATHS IN CONNECTICUT, 1968-1969

Connecticut Safety Commission

1970 8p

Prepared in cooperation with the Connecticut State Department of Health.

This statistical report covers all categories of accidental deaths, including traffic, motor vehicle (non-traffic), home, occupational, and public. According to the current records, Connecticut has registered the lowest accidental death rate in the nation. Of the fatalities, 41% took place in motor vehicle accidents and 31% in home accidents. Males were nearly 67% of accidental death victims. Age groups of victims are given.

Search terms: Fatalities by age; Fatalities by sex; Accident statistics; Accident types; Fatality rates; Vehicle accidents; Traffic accidents; Industrial accidents; Connecticut; Males; Age factor in accidents

2/0 HIGHWAY SAFETY

HS-010 643 Fld. 2/0

A NEW TRAFFIC SAFETY CLIMATE

by Charles A. Krouse

Published in *Journal of Insurance Information* v28 n5 p29-31 (Sep-Oct 1967)

With the passage in 1966 of the National Traffic and Motor Vehicle Safety Act and the Highway Safety Act, the Congress designated the Secretary of Transportation as the individual ultimately responsible for shaping and coordinating the national traffic safety effort. An outline of the federal program is given.

Search terms: National Traffic and Motor Vehicle Safety Act of 1966; Highway Safety Act of 1966; Federal role; Highway safety programs; Highway safety standards; Government industry cooperation

2/4 Design and Construction

HS-010 644 Fld. 2/4

BUILT-IN DEATH TRAPS ON OUR ROADS

by Joseph Linko

Published in *Journal of Insurance Information* v28 n5 p14-9 (Sep-Oct 1967)

A private citizen who for five years toured the area around New York City and took 3,000 color transparencies of roadside hazards is interviewed. He was called to testify and show his slides before a Congressional committee. The main types of hazards that he found are guardrails not properly terminated or not installed at the right place, signs made of steel beams and supported by concrete stanchions at the bottom, trees, and bridges.

Search terms: Fixed objects; Sign supports; Trees; Roadside hazards; Photographs; Guardrail design; Bridges

HS-010 645 Fld. 2/4; 4/7

A TECHNIQUE FOR MEASURING "EFFECTIVE" ROAD PROFILES

by Allan P. Whittemore

General Motors Corp.

1972 5p 5 refs
Report no. SAE-720094

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

A method of measuring the "effective" profile of road surfaces at highway speeds has been developed. This method is of particular interest to engineers involved in the study of vehicle ride and vibration phenomena on laboratory road simulators, because the measured road profiles include the effects of tire enveloping, thereby eliminating the need to simulate them. Furthermore, the road profiling instrumentation can be adapted to any vehicle which facilitates simulator to road correlation studies.

Search terms: Road simulators; Road profiles; Road surfaces; Measuring instruments

AVAILABILITY: SAE

HS-010 646 Fld. 2/4; 5/3

EFFECT OF PAVEMENT GROOVING ON MOTORCYCLE RIDEABILITY. INTERIM REPORT

by George B. Sherman; John B. Skog; Melvin H. Johnson; Gene S. Stucky

California Div. of Highways

1969 29p 3 refs
Report no. M&R-633126-6

A study was conducted to determine if motorcycle safety was impaired by pavement grooving and which pattern of grooving resulted in the least sensation to the cyclist. Six common grooving patterns were cut into an abandoned road section, and experienced cyclists tested seven machines from very small to large size, which used different tire treads. The pavement grooving patterns did not present a hazardous riding condition. In general the lighter machines were more sensitive to the grooving patterns; however, none had any control problem. No individual grooving pattern was considered to be consistently superior or for rideability.

Search terms: Grooving; Motorcycle road interface; Motorcycle safety; California; Pavement tests; Motorcycle handling; Motorcycle characteristics; Coefficient of friction; Vehicle riding qualities

2/7 Meteorological Conditions

HS-010 647 Fld. 2/7; 4/8

REDUCTION OF AIR POLLUTION POTENTIAL THROUGH ENVIRONMENTAL PLANNING

by J. C. Fensterstock; J. A. Kurtzweg; G. Ozolins

Published in *Journal of the Air Pollution Control Association* v21 n7 p395-9 (Jul 1971)

1 ref

Urban and transportation planning may supplement the control of source emissions. The Air Pollution Control Office of the Environmental Protection Administration has begun projects in three general areas where pollution considerations can be introduced into planning and decision making: large-scale and long-term urban development, design and operation of transportation systems, and location, design and construction of roadways and structures. Data are presented from Seattle land use planning and from pollutant monitoring in New York City; the importance of coordination with other planning groups is emphasized.

Search terms: Environmental planning; Air pollution control; Regional planning; Urban planning; Transportation planning; Highway planning; Seattle; Carbon monoxide; Air pollution control agencies; Environmental Protection Administration; Federal role; New York (city)

2/9 Traffic Control

HS-010 648 Fld. 2/9

DEVELOPMENT OF AN INFRARED SOURCE-SENSOR SYSTEM

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p47-53

A sensor was developed for monitoring the speed and distance of the preceding vehicle. The system will detect a vehicle at a distance of 400 feet in clear weather, and needs testing in bad weather conditions.

Search terms: Driver aid systems; Speed sensors; Infrared scanning; Sensors; Environmental factors; Distance headways

H S-010 649 Fld. 2/9; 1/3 4/3

RELATIONSHIP BETWEEN HEADWAY DISTRIBUTION AND ACCIDENTS

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p87-98

11 refs

The objectives of intervehicle communications — to reduce accidents and to increase average speeds and traffic volumes — are not equally applicable to all highway sections. It is concluded that there is expected to be some range of gap sizes that will yield the largest return of benefit in terms of increased density. The identification of this range can be calculated, based on assumptions relative to the effect of increased information to the driver.

Search terms: Accident types; Accident costs; Driver reaction time; Headways; Benefit cost analysis; Traffic flow; Car following; Time costs; Traffic density; Accident rates; Highway communication; Gap acceptance

HS-010 650 Fld. 2/9; 4/7

THEORY OF INTERVEHICULAR CONTROL SYSTEMS

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p98-105

2 refs

Several systems of vehicle control are analyzed mathematically: relative velocity control, relative velocity control with zero reaction time, combined acceleration and relative velocity control, and headway control.

2/9 Traffic Control (Cont'd.)**HS-010 650 (Cont'd.)**

Search terms: Mathematical analysis; Headways; Automatic headway control; Traffic flow; Car following; Acceleration; Automatic control; Driver reaction time; Vehicle control; Automatic speed control

HS-010 651 Fld. 2/9; 4/7**TRAFFIC FLOW DATA COLLECTION AND ANALYSIS**

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p62-7

Photogrammetric techniques using a marked car in the traffic stream can give accurate spacing and velocity data on platoons to define traffic flow characteristics. Photographs taken from a helicopter showed spacing and velocity errors of 0.75 feet and 0.4 mph, respectively. Analysis of a small sample indicates agreement between observed and theoretical wave speeds.

Search terms: Aerial photography; Traffic flow; Platoons; Waves; Mathematical models; Photogrammetry; Vehicle spacing; Speed patterns; Traffic data analysis; Vehicle trajectories

H S-010 652 Fld. 2/9; 4/7**THEORETICAL ASPECTS OF TRAFFIC CONTROL**

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p67-71

5 refs

A theoretical approach was used to study the continuity of traffic flow and to develop a theory based on the flow-density relationship, because these two factors can be measured for traffic control purposes. It was demonstrated that traffic flow depends on two factors, the delay time in propagating changes and the ratio of traffic density of moving traffic to the density of traffic in jam conditions. Methods for the measurement of data on traffic flow, kinematics, and shock waves have been developed.

Search terms: Traffic flow; Waves; Traffic disturbances; Traffic density; Mathematical models; Traffic control; Traffic congestion; Waiting time; Kinematics

HS-010 653 Fld. 2/9; 4/7**LONGITUDINAL CONTROL SYSTEMS FOR PLATOON MOVEMENT**

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p72-81

12 refs

The theoretical investigation of control systems has shown that considerable improvement in traffic flow and traffic safety can be obtained with a longitudinal control and guidance system. The same principles apply to either vehicle-contained or highway-contained sensing and communication systems. Two different control functions appear to be most useful to achieve longitudinal control in traffic flow: duplication of the acceleration pattern of the lead vehicle by the trailing vehicle and differential speed between the lead vehicle and the trailing vehicle.

Search terms: Waves; Traffic disturbances; Traffic density; Mathematical models; Automatic headway control; Time factors; Traffic flow; Platoons; Automatic control; Guidance systems; Sensors; Acceleration; Car following

HS-010 654 Fld. 2/9; 4/7**DIFFERENTIAL MODELS RELATING TO INTERVEHICULAR COMMUNICATIONS**

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p82-7

7 refs

Several analytic models or mathematical representations of vehicle flow and physical phenomena apply to intervehicular communication. This appendix reviews several of these models and discusses their applicability to communication problems. Emphasis is given to models of differential following, fluid flow, and kinematic waves.

Search terms: Headways; Waves; Kinematics; Traffic flow; Car following; Mathematical models; Traffic models; Fluid flow

HS-010 655 Fld. 2/9; 5/4**VEHICLE INSTRUMENTATION**

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p81-2

Two instrumented vehicles are described briefly.

Search terms: Instrumented vehicles; Measuring instruments

HS-010 656 Fld. 2/9; 5/10**SENSING AND COMMUNICATION BETWEEN VEHICLES**

by Thomas H. Rockwell; Joseph Treiterer

Ohio State Univ.

1968 117p refs
Report no. NCHRP-51

Sponsored by the American Assoc. of State Hwy. Officials in cooperation with the Bureau of Public Roads. Includes HS-010 648-655, HS-010 661-662, HS-010 692, and HS-010 694-698.

The investigation presents an evaluation of four automobile taillight signal systems, an investigation of the motorist's use of turn signals, a study of longitudinal control systems for platoon movement, and a study of passing decisions on a multi-lane expressway. An infrared source-sensor system has been designed and tested to provide the driver with a visual display of relative velocity and spacing between vehicles. Aerial photogrammetric methods have also been devised to aid in the study of traffic flow phenomena. It is believed that this research effort is one of the most comprehensive studies to date of modern intervehicular sensing and communication systems.

Search terms: Speed sensors; Driver aid systems; Overtaking; Vehicle spacing display devices; Communication systems; Taillamps; Turn signals; Passing; Freeways; Sensors; Decision making; Automatic control; Photogrammetry; Traffic flow; Platoons; Infrared scanning; Highway communication

AVAILABILITY: HRB

3/0 HUMAN FACTORS

3/1 Alcohol

HS-010 657 Fld. 3/1; 4/1

A DISASTROUSLY COMPLICATED OFFENCE: DRUNKEN DRIVING, ROAD SAFETY ACT 1967

by Michael Newark; Alec Samuels

Published in *Medicine, Science and the*

Law v10 n2 p59-68 (Apr 1970); v10 n3 p160-70 (Jul 1970)

44 refs

British court decisions and interpretations are discussed for: breath tests, likelihood of driving, proof of tests, location of test, failure to provide a specimen, arrest, hospital patients, blood specimens, warning and refusal to provide a laboratory specimen, double jeopardy under the 1967 and 1960 acts, improperly obtained evidence, strict liability, entitlement to testing, factors in driver disqualification, and civil rights.

Search terms: Alcohol laws; Alcohol breath tests; Alcohol blood tests; Breathalyzers; Drinking drivers; Court decisions; Police law enforcement responsibilities; Great Britain; Alcohol test refusal; Road Safety Act of 1967 (Great Britain); Driver license revocation; Legal rights; Evidence

3/2 Anthropomorphic Data

HS-010 658 Fld. 3/2

A PREDICTION MODEL OF HUMAN VOLITIONAL MOBILITY

by Don B. Chaffin; Rodney K. Schutz; Richard G. Snyder

Michigan Univ.

1972 16p 3 refs
Report no. SAE-720002

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Empirical models are presented which predict the three-space position of the torso when responding to reaches with the right arm. Models were derived which specify torso position in terms of the spacial location of 10 surface markers. These markers were positioned over palpable skeletal points of the spine and shoulder girdle. The necessary data were obtained through photogrammetric procedures utilizing four orthogonal

cameras. The independent (input) variables to these models are the coordinates of the reach target. A supplementary, slightly more accurate, set of models was also derived in which the set of independent variables was enlarged to include the anthropometric dimension of the subject. The second, concurrent phase of the analysis resulted in the derivation of a set of models which describes the configuration of the internal, torso skeletal system. The vector distances and angles between external surface markers and internal bone articulations points can be calculated from these models. A radiographic procedure using orthogonal or oblique x-ray photographs was used to generate the required data. The relative advantages of the present empirical models over the traditional heuristic, hard-link biomechanical models is discussed.

Search terms: Anthropometry; Photogrammetry; Radiography; Simulation models; Arm motion range; Human body simulation; Ergosphere; Bones; Human body segment parameters; Human body size; Spine

AVAILABILITY: SAE

HS-010 659 Fld. 3/2

PEDAL OPERATION BY THE SEATED OPERATOR

by K. H. Eberhard Kroemer

Aerospace Medical Res. Lab.

1972 11p 55 refs
Report no. SAE-720004; AMRL-TR-71-102

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

This paper attempts to serve three purposes: 1. To summarize the open scientific literature on muscular force applicable to pedals, and on the efficiency of foot motions on or between pedals depending on the body support and the body posture of the seated operator. 2. To discuss the applicability of such

3/2 Anthropomorphic Data (Cont'd.)

HS-010 659 (Cont'd.)

studies in automobile (or other equipment) design, especially to the design, selection, and arrangement of foot-operated controls. 3. To point out that for most conventional vehicles and equipment, modes of seating, and of pedal arrangement and operation follow largely common experience and tradition, and only partly scientific findings. For new man-machine systems, new solutions seem possible.

Search terms: Mathematical models; Seat design; Pedal force; Reviews; Foot motion range; Pedal travel; Human factors engineering; Anthropometry; Man machine systems

AVAILABILITY: SAE

3/4 Driver Behavior

HS-010 660 Fld. 3/4

LET'S BLACKBALL DANGEROUS DRIVERS!

by Warren N. Gaffney

Published in *Journal of Insurance Information* v28 n5 p20-4 (Sep-Oct 1967)

Statistics show that only a minor percentage of accidents are caused by vehicle or roadway defects. The core of the accident problem always has been and still is the driver, and it is only by reaching the mind and curbing the reckless impulses of the individual driver that accidents can be prevented. A plan is proposed wherein all cars would wear either green or red symbols on windshields and rear windows, cars driven by persons convicted of reckless driving being required to wear the red ones. Any motorists sharing the road with a red stickered car would interpret such warning as a signal to drive with extra care, even defensively, until the danger has passed.

Search terms: Careless driving; Defensive driving; Problem drivers; Reckless driving; Driver identification; Color coding

HS-010 661 Fld. 3/4; 2/4; 4/7

DRIVING CONTROL BEHAVIOR AND ROADWAY GEOMETRY

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p38-43

Driver control behavior on expressways was studied. Gas pedal movements and effects of route vertical curvature were studied by means of regression analysis.

Search terms: Road curves; Vehicle control; Driver performance; Regression analysis; Speed patterns; Driving task analysis; Pedal travel; Topographical factors

HS-010 662 Fld. 3/4 2/9

PASSING ON A MULTI-LANE EXPRESSWAY

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p32-7

Driver performance in accepting and moving into a gap in an adjacent lane was studied to determine how closely present performance approaches the limits of safety. Variance and probit analysis were made of the effects of headway on response decision time with several velocity conditions.

Search terms: Headways; Passing; Gap acceptance; Decision making; Car following; Variance analysis; Driver reaction time; Speed patterns; Probit analysis

3/5 Driver Education

HS-010 663 Fld. 3/5

IS YOUR NUMBER UP?

by Joseph Martin; Douglas Sefton

Published in *Journal of Insurance Information* v28 n5 p25-8 (Sep-Oct 1967)

Young drivers have high accident rates. Driver education through the schools would reduce the toll of death and injury among the young and the victims of the young. Most states subsidize driver education programs in the school systems, but facilities available haven't kept up with the population. One of the failures of driver education is that it does not teach what to do in case of emergency situations—a skid for example. A list of simple rules of safe driving is included.

Search terms: Driver education; High school driving courses; Driver skills; Adolescent drivers; Accident rates; Young adult drivers; Driver emergency responses

HS-010 664 Fld. 3/5; 3/4

BETTER DRIVING MAY SAVE YOUR LIFE ONE DAY

by Keith E. Jolles

Published in *Nursing Times* v66 n37 p1168-71 (10 Sep 1970)

The most important factor in safe driving is the driver himself. Great Britain has advanced driver training schools where one can learn how to drive out of emergency situations. Advanced driving should be considered by everyone, as most accidents occur within ten miles of home and drivers have been killed at less than 12 mph. The author's experiences at the Fradley skid pan and his tests for advanced driving are described.

Search terms: Automobile driving ranges; Commercial driving schools; Skid pans; Skidding; Driver emergency

responses; Driver skills; Driver tests; Driver education; England; Wet road conditions; Defensive driving

3/6 Driver Licensing

HS-010 665 Fld. 3/6

DRIVER LICENSE SUSPENSIONS: CALENDAR YEAR-1970

Texas Dept. of Public Safety

1970 9p

Statistics on driver license suspension and denials in 1970 in Texas are given by county, with separate tabulations of race and sex of drivers, duration of suspensions, types of driver license, age of drivers suspended or denied, and number of previous offenses, tabulated by reason for suspension or denial.

Search terms: Driver statistics; Driver license denial; Driver license suspension; Driver age; Driver sex; Racial factors; Driver licenses; Accident repeater drivers; Traffic law violations; Texas

3/9 Impaired Drivers

HS-010 666 Fld. 3/9; 3/6

LICENSING THE DRIVER WITH CARDIOVASCULAR DYSFUNCTION

by John M. Douglass; Michael S. Stock; William O. Light; Frederic D. Burg

Published in *American Heart Journal* v80 n2 p197-201 (Aug 1970)

4 refs

The United States Public Health Service has prepared a monograph giving recommendations concerning the licensing of medically impaired motor vehicle operators. This section of the monograph is presented here to help cardiologists better counsel their patients. The criteria

for defining impairment and classification of type of vehicle licensing being used are given under the headings: heart disease; cardiac pacemakers; hypertensive vascular disease; vascular disease affecting the extremities; vascular aneurysms.

Search terms: Cardiovascular diseases; Cerebrovascular diseases; Pacemaker (cardiac); Heart diseases; Driver physical fitness; Disability evaluation; Driver license standards; Hypertension

HS-010 667 Fld. 3/9; 3/6

HEART DISEASE AND FITNESS TO DRIVE MOTOR VEHICLES

by Walter Somerville

Published in *Medico-Legal Journal* v38 p42-50 (1970)

6 refs

Presented at a meeting of the Medico-Legal Society, London, 12 Feb 1970. Includes discussion.

The problem of driving and heart disease is discussed under three headings: the effect of driving on the normal heart and the diseased heart; accidents resulting from heart disease in drivers; heart diseases which make driving dangerous. Standards for drivers of heavy vehicles and public service vehicles should be more strict than standards for drivers of private cars.

Search terms: Heart diseases; Driver license standards; Medical factor caused accidents; Driver physical fitness; Great Britain; Driving tasks; Professional drivers; Accident risks

3/12 Vision

HS-010 668 Fld. 3/12

PRELIMINARY ASSESSMENT OF THE IMPORTANCE OF PERIPHERAL VISION

by R. C. Cliff

California Univ., Berkeley

1966 12p 10 refs
Report no. 66-2

From a literature survey and analysis, it appears that peripheral vision (from 25 to about 60 or 70 degrees) plays a relatively minor part in road tracking because of its relatively poor acuity and the effects of speed smear. It is unlikely, also, that much information about road position (not obstacles) is gained when looking elsewhere. Suggestions are made for experiments on vector-field and road-position sensing and possible applications of the velocity-difference hypothesis to driving simulators and task description.

Search terms: Peripheral vision; Visual acuity; Visual perception; Driving tasks; Reviews; Visual fields; Velocity perception; Vehicle control; Tracking; Motion perception

HS-010 669 Fld. 3/12; 3/6

VISUAL FACTORS IN AUTOMOBILE DRIVING, AND PROVISIONAL STANDARDS

by H. A. Fenner, Jr.; Richard C. Dillihunt; Arthur H. Keeney; William K. Keller; Abraham J. Mirkin; Paul L. Weygandt; Lee N. Hames

Published in *Archives of Ophthalmology* v81 p865-71 (Jun 1969)

15 refs

Standards of vision intended for ophthalmologists or physicians involved in driver licensing, and formally approved by the American Medical Association Committee on Medical Aspects of Automotive Safety on January 25, 1969, are presented for: central visual acuity; field of vision (form field); color vision; stereopsis; associated ocular pathology; post-operative aphakia or ocular conditions following surgical removal of cataractous lenses; accommodative impairments in presbyopia; heterophoria; dynamic visual

3/12 Vision (Cont'd.)**HS-010 669 (Cont'd.)**

acuity; visual functions affecting night-time driving; and special certification.

Search terms: Driver vision standards; Vision tests; Visual acuity; Visual fields; Central vision; Color perception; Depth perception; Vision disorders; Night vision; Driver license standards; Binocular disparity

4/0 OTHER SAFETY-RELATED AREAS**4/6 Insurance****HS-010 670 Fld. 4/6****INSURANCE SUPPORT FOR FEDERAL ACTION**

by Leonard J. McEnnis, Jr.

Published in *Journal of Insurance Information* v28 n5 p32-6 (Sep-Oct 1967)

"Operation Cover-All" is an industry wide effort aimed at mobilizing grassroots support for several of the highway safety standards. The Insurance Institute for Highway Safety has been designated to take the lead in the campaign. "Operation Cover-All" gives special emphasis to the following five standards: motor vehicle inspection; re-examination of drivers; driver education; traffic records; and emergency medical service.

Search terms: Safety standards; Safety programs; Vehicle inspection; Insurance industry; Driver license renewal; Driver education; Traffic records; Emergency medical services; Safety campaigns; Safety propaganda; Community support

4/7 Mathematical Sciences**HS-010 671 Fld. 4/7; 1/3****CONCEPTUALIZATION AND USE OF ROAD SAFETY AND TRAFFIC ENGINEERING FORMULAS**

by Anthony Peranio

Published in *Traffic Quarterly* v25 n3 p429-46 (Jul 1971)

12 refs

Several common formulas used in traffic and road safety research are analyzed for their limitations, and criteria are described for testing their quality. Precautions are suggested for construction and application of mathematical models. Examples discussed are: traffic flow, accident rates, and the relationship between violations and accidents.

Search terms: Traffic engineering; Mathematical models; Fatality rates; Model tests; Variables; Traffic flow; Mathematical analysis; Traffic law violations; Accident rates; Driver records; Problem drivers; Travel time; Traffic data analysis

HS-010 672 Fld. 4/7; 3/4**THE VALUE OF TIME FOR PASSENGER CARS: A THEORETICAL ANALYSIS AND DESCRIPTION OF PRELIMINARY EXPERIMENTS. FINAL REPORT. VOL. 1**

by Dan G. Haney; Jeanne L. Anderson; Gertrude D. Peterson; Peter D. Fox; Thomas C. Thomas; David A. Curry

Stanford Res. Inst.

1967 174p 236 refs
Contract CPR-11-0959
Report no. PB-175 653

The objectives of this research program were: to conduct a review of research

on the value of time; to explore theoretical problems in estimating values of time for use in highway economy studies; to conduct experimental analyses leading to estimates of time value; and to develop mathematical models for deriving value of time estimates in specific situations. Interviews on driving attitudes, route preference, trip purposes, and route choice are described.

Search terms: Travel time costs; Economic analysis; Highway economic factors; Driver behavior; Variance analysis; Mathematical models; Driver attitudes; Time costs; Decision making; Route preferences; Vehicle operating costs; Interviews; Reviews; Driver attitudes; Mathematical analysis; Probability theory; Travel patterns; Commuting patterns; Trip purpose

AVAILABILITY: NTIS

5/0 VEHICLE SAFETY**5/1 Brake Systems****HS-010 673 Fld. 5/1; 5/14; 5/22****TO SAVE YOUR LIFE**

by P. J. Brown

National Bureau of Standards

Published in *National Conference on Weights and Measures* (54th) (NBS-SP-318) 1969 p17-24

1969

Presented at the 54th National Conference on Weights and Measures, Washington, 9-13 Jun 1969.

A major emphasis of the conference was to discuss the practical use of weights and measures work in the protection of the consumer, especially in the quality grading system for tires and the development of motor vehicle safety performance standards. To establish safety performance requirements in restraint systems, tires, and braking systems, NBS reviewed some of the research and

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measurements of simulated crash conditions in the laboratory. Brake fluids and their performance, especially the boiling points and water contents, are of concern. Adverse effects of under- and over-inflation of tires as a result of inaccurate filling statim air towers is mentioned.

Search terms: Safety standards; Restraint system tests; Tire tests; Tire standards; Brake fluid tests; Brake fluid standards; Consumer protection; Accident simulation; Test equipment; Tire inflation pressure; Air pumps

HS-010 674 Fld. 5/1; 5/17

BRAKE SYSTEM SAFETY ANALYSIS

by George R. Olsson; James A. Mateyka; Joseph J. Innes

Booz-Allen Applied Res., Inc.; National Hwy. Traf. Safety Administration

1971 57p 22 refs
Report no. SAE-710593

Presented at the SAE Mid-Year Meeting, Montreal, 7-11 Jun 1971.

A new technique in safety engineering for complex systems is the fault tree analysis method. The work is directed toward the identification and ranking of brake system failure modes which may be critical as accident causation factors. Safety criticality for each failure mode is defined as the product of probability of occurrence and severity of effect on vehicle control. Failure data for the brake system components are obtained from maintenance and repair records of a large automobile leasing fleet. Results are interpreted in relation to federal safety standards and motor vehicle inspection requirements.

Search terms: Brake failures; Brake standards; Recall campaigns; Trees (mathematics); Vehicle inspection; Systems analysis; Flow charts; Accident causes; Accident risk forecasting;

Vehicle control; Loss of control; Automobile defects; Brake systems; Brake maintenance

AVAILABILITY: SAE

HS-010 675 Fld. 5/1; 5/20

AIR/HYDRAULIC BRAKE SYSTEM FOR HEAVY DUTY VEHICLES

by George E. Terment

Bendix Corp.

1972 6p
Report no. SAE-720059

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

An air/hydraulic brake system is offered to power disc brakes on heavy duty vehicles. The principal advantages are that the system is composed largely of service proven air brake components and the system would be compatible with existing air braked trailers.

Search terms: Hydraulic brakes; Heavy duty vehicles; Air brakes; Spring brakes; Articulated vehicles; Brake system design

AVAILABILITY: SAE

HS-010 676 Fld. 5/1; 5/22

DESIGN AND DEVELOPMENT OF AN HYDRAULIC POWERED WHEEL SLIDE PROTECTION SYSTEM

by Robin A. Cochrane

Girling Ltd. (England)

1972 9p 3 refs
Report no. SAE-720031

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

A Wheel Slide Protection system is considered in which a hydraulic power

source is used to modulate braking effort at each wheel of a vehicle. The reasons for selecting this type of power source are discussed, together with other parameters employed in the design of the system. System operation is described with particular emphasis on the functioning of the hydraulic actuators and their response to electrical control signals. Evaluation has been carried out on different vehicles over a wide range of surfaces. Certain observations are made as a result of these tests.

Search terms: Braking; Hydraulic equipment; Skidding; Brake system design; Actuators; Antilocking devices; Brake performance; Wheel Slide Protection System; Brake tests; Electro-hydraulic brake systems

AVAILABILITY: SAE

5/4 Design

HS-010 677 Fld. 5/4

SAFETY SIGNS FOR AGRICULTURAL, EARTHMOVING AND FORESTRY MACHINES

by James E. Arndt

Deere and Co.

1971 5p
Report no. SAE-710707

Presented at the National Farm, Construction, and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

Operators of machines used in agriculture, construction, and forestry industries can be involved in accidents due to inappropriate actions while servicing or operating the machines. It, therefore, becomes desirable to warn them of certain types of personal hazards when they are on or around machines. This can be accomplished with the use of a safety sign. For safety signs to do their job effectively, it is desirable that they be similar in format and design. Furthermore, they should be carefully written,

5/4 Design (Cont'd.)

HS-010 677 (Cont'd.)

appropriately placed, and be distinctive on the equipment.

Search terms: Accident prevention; Vehicle safety; Sign color; Sign design; Sign effectiveness; Sign legibility; Sign location; Sign standards; Industrial health hazards; Construction vehicles; Farm vehicles; Injury prevention; Warning signs; Sign history; Sign visibility

AVAILABILITY: SAE

HS-010 678 Fld. 5/4

THE EFFECTS ON BODY STRUCTURES OF PRESENT AND POSSIBLE FUTURE SAFETY LEGISLATION, AND THE MATHEMATICAL SIMULATION OF BARRIER IMPACT

by J. Curtis

Vauxhall Motors Ltd. (England)

1970 19p

Presented to the Institute of Mechanical Engineers, Cranfield, England, 6 Jun 1970.

The paper briefly reviews present and possible future safety legislation which has a bearing on vehicle structure. A mathematical model to simulate barrier impact using empirical crash data is described, which is similar to a model developed by General Motors. Different types of deceleration pulse are discussed, and a target pulse is suggested for use when attempting to modify vehicle crash characteristics. The use of the impact simulation program to produce data for a body load and stress analysis program is mentioned, together with possible future improvements in barrier impact simulation models. A short discussion of rear impact, with a suggested simple mathematical model, is included. Some

problems associated with side impact are briefly described.

Search terms: Equations of motion; Safety laws; Impact tests; Barrier collision tests; Deceleration; Simulation models; Mathematical models; Stress analysis; Rear end collisions; Side impact collisions; Crashworthy bodies

HS-010 679 Fld. 5/4; 5/1; 5/18

A DESIGN ANALYSIS OF THE NEW BRITISH MEDIUM SIZE VAUXHALL VICTORS. PT. 3: THE BRAKING SYSTEM, RACK-AND-PINION STEERING GEAR, ENERGY-ABSORBING STEERING COLUMN ASSEMBLY, AND UNITARY BODY STRUCTURE

Anonymous

Published in *Automobile Engineer* v58 p42-50 (Feb 1968)

Design features of the Vauxhall Victor are described and illustrated.

Search terms: British vehicles; Automobile design; Brake systems; Energy absorbing steering columns; Steering systems; Unitized body construction; Automobile models; Vauxhall Victors

HS-010 680 Fld. 5/4; 4/5

AUTOMATED TUBE DESIGN THROUGH COMPUTER GRAPHICS

by John O. Nicholson

International Harvester Co.

1971 18p
Report no. SAE-710714

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

International Harvester Co. has developed a computerized graphics system of designing and fabricating tubing. The

system will assist in the tube design, and will prepare detail part drawings, templates, interference checking drawings, and will generate fabricating data for tube bending. The procedure has reduced engineering and manufacturing costs while improving product quality.

Search terms: Computerized design; Computer programs; Tubes

AVAILABILITY: SAE

HS-010 681 Fld. 5/4; 4/7

THE APPLICATION OF FINITE ELEMENT TECHNIQUES TO THE ANALYSIS OF AN AUTOMOBILE STRUCTURE

Published in *Institution of Mechanical Engineers Proceedings* 1970-71 v185 n44/71 p665-90

20 refs

Includes HS-010 682-684.

The finite element technique has been used for automobile chassis analysis. Computer programs were developed to predict static deflection and stress levels under bending and torsion loads and, with an inertia matrix, to predict natural frequencies and mode shapes. Effects of shear deflections, tapered beams, and manufacturing tolerances are considered. Predictions are compared with experimental results.

Search terms: Automobile design; Torsion; Shear stress; Chassis design; Frame design; Test equipment; Computerized design; Static loads; Mathematical analysis; Mathematical models; Stress analysis; Structural analysis; Forecasting; Finite element method; Beam tests; Dynamic structural analysis; Equations; Inertia

HS-010 682 Fld. 5/4; 4/7

STATIC ANALYSIS OF AN AUTOMOBILE CHASSIS FRAME

by R. Ali; J. L. Hedges; B. Mills

Published in HS-010 681, *Institution of Mechanical Engineers Proceedings 1970-71* v185 n44/71 p665-74

12 refs

The finite element technique has been used for the static analysis of a chassis structure. A computer program was developed to predict static deflections under bending and torsion loads. The program is quite general, but its use has been restricted to structures consisting of beam elements only. The effects of shear deflections and tapered beams and manufacturing tolerances of cross sections are also considered. Predictions of static deflections are compared with experimental results.

Search terms: Automobile design; Chassis design; Frame design; Test equipment; Computerized design; Beam tests; Forecasting; Mathematical models; Stress analysis; Structural analysis; Static tests; Finite element method; Static loads; Bending; Torsion; Deflection; Shear stress

HS-010 683 Fld. 5/4; 4/7

STRESS ANALYSIS OF AN AUTOMOBILE CHASSIS FRAME

by J. L. Hedges; C. C. Norville; O. Gurdogan

Published in HS-010 681, *Institution of Mechanical Engineers Proceedings 1970-71* v185 n44/71 p675-82

6 refs

The finite element technique has been used for the stress analysis of a chassis structure. A computer program was developed to predict stress levels under bending and torsion loads. The program is quite general but its use has been

restricted to structures consisting of beam elements only. Coarse and refined idealizations of the structure are analyzed, and the effect of manufacturing tolerances of cross-sections is discussed. Predictions of stresses are compared with experimental results.

Search terms: Automobile design; Chassis design; Frame design; Test equipment; Computerized design; Mathematical models; Stress analysis; Structural analysis; Finite element method; Torsion; Shear stress; Bending; Beam tests; Forecasting

HS-010 684 Fld. 5/4; 4/7

DYNAMIC ANALYSIS OF AN AUTOMOBILE CHASSIS FRAME

by R. Ali; J. L. Hedges; B. Mills

Published in HS-010 681, *Institution of Mechanical Engineers Proceedings 1970-71* v185 n44/71 p683-90

2 refs

The finite element technique has been used for the prediction of natural frequencies and mode shapes of a chassis structure. The program developed in Paper 1 was extended by adding an inertia matrix. The effects of shear and tapered beams were also considered and predictions of frequencies and mode shapes are compared with experimental results.

Search terms: Automobile design; Chassis design; Frame design; Frequencies; Test equipment; Computerized design; Inertia; Mathematical analysis; Mathematical models; Stress analysis; Vibration analysis; Beam tests; Finite element method; Forecasting; Dynamic structural analysis; Shear stress

HS-010 685 Fld. 5/4; 5/17

TECHNIQUES FOR STRUC- TURAL EVALUATION OF EN- GINE COMPONENTS BY BENCH- FATIGUE TESTING

by G. L. Lovstrand

Caterpillar Tractor Co.

1971 8p 1 ref

Report no. SAE-710699

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

Bench-fatigue testing can be a superior tool for assuring that an engine component is an adequate structure, although it does not replace endurance operation of engines in laboratory and field. Bench-fatigue tests can be more effective; that is, easier, quicker, cheaper, more definitive, than stress analysis or nonfailure testing. Examples of engine-component testing are given to illustrate the techniques.

Search terms: Failure stress; Fatigue tests; Fatigue life; Engine tests; Laboratory tests; Automotive parts; Loading tests; Loads (forces); Thermal factors

AVAILABILITY: SAE

HS-010 686 Fld. 5/4; 5/20

ACCELERATED TESTING OF HYDRAULIC COMPONENTS

by Robert E. Kay

Sperry Rand Corp.

1971 7p

Report no. SAE-710700

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

This paper discusses a hydraulic component manufacturer's approach to accelerated testing of hydraulic system components for use on farm and construction equipment. Information gained through instrumentation of vehicles and from vehicle manufacturers is employed to achieve a high level of hydraulic system reliability.

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5/4 Design (Cont'd.)

HS-010 686 (Cont'd.)

Search terms: Hydraulic equipment; Hydraulic design factors; Accelerated tests; Test equipment; Quality control; Automotive parts; Automotive parts industry; Reliability

AVAILABILITY: SAE

5/6 Fuel Systems

HS-010 687 Fld. 5/6

EFFECTS OF TOLUENE CONTENT IN FUEL ON AROMATIC EMISSIONS IN THE EXHAUST

by J. S. Ninomiya; B. Biggers

Published in *Journal of Air Pollution Control Association* v20 n9 p609-11 Sep 1970

9 refs

The effect of the toluene level in fuels on the concentrations of aromatic products in the exhaust was studied. The fuel blends contained 20, 40, 60, and 80 weight percent toluene and the balance consisted of isooctane and n-heptane. Each blend had a research octane number of 100. When the exhaust products are expressed as a mole fraction of toluene burned: benzene and benzaldehyde showed no change, and ethylbenzene and styrene increased, with decreasing toluene content of the fuel blends. The fractional mole concentration of unburned toluene in the exhaust decreased as the paraffin content of the blends increased. The results can be explained on the basis of toluene decomposition and the subsequent reactions of the resulting radicals.

Search terms: Exhaust composition; Exhaust emission tests; Laboratory tests; Fuel combustion; Fuel composition; Toluene; Aromatic compounds;

Hydrocarbons; Exhaust emissions reactivity; Octane requirements; Benzene; Benzaldehyde; Ethylbenzene; Styrene

HS-010 688 Fld. 5/6

THE STUDY ON FLOW METER OF CARBURETOR OF PRACTICAL VALUE

by Junzo Uozumi; Toshikazu Suzuki

Published in *Bulletin of the Society of Automotive Engineers of Japan* n3 p35-43 (Mar 1971)

3 refs

A portable flow meter which can be used without removing the carburetor from the vehicle is being developed. The accuracy of the meter is tested and discussed. Characteristic qualities, mainly air-fuel ratio with the normal steady flow meter, are compared with the qualities of the case when this flow meter is installed directly on the engine. Measured air-fuel ratios are equal during partial throttle driving conditions, but differ in full throttle driving conditions in 4-cylinder engines.

Search terms: Air fuel ratio; Air flow; Fuel flow; Engine performance; Flowmeters; Carburetors; Accuracy; Mathematical analysis; Engine operating conditions

HS-010 689 Fld. 5/6

A COMPARISON OF PHENOLDISULFONIC ACID, NONDISPERSIVE INFRARED, AND SALTZMAN METHODS FOR THE DETERMINATION OF OXIDES OF NITROGEN IN AUTOMOTIVE EXHAUST

by G. E. Fisher; T. A. Huls

Published in *Journal of the Air Pollution Control Association* v20 n1 p666-71 (Oct 1970)

5 refs

The Saltzman, phenoldisulfonic acid, and nondispersive infrared methods have been compared to determine whether the nondispersive infrared method could be used as a possible replacement for the Saltzman method. Results show that the nondispersive infrared analyzer can be used to measure exhaust gases with advantages over both the Saltzman and phenoldisulfonic acid methods. These advantages include simplicity, speed, less complicated analytical technique, and the fact that it is better adapted to be carried out by technicians at the test site.

Search terms: Laboratory tests; Nitrogen oxides; Infrared analyzers; Colorimetry; Exhaust emission tests; Measuring instruments; Exhaust emissions sampling

HS-010 690 Fld. 5/6; 5/4

THE INFLUENCE OF ENGINE AND FUEL FACTORS ON AFTER-RUN

by Jack C. Benson

General Motors Res. Labs.

1972 10p 12 refs
Report no. SAE-720085

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Engine after-run, sometimes referred to as "run-on" or "dieseling," has existed for many years, but seems to be occurring more frequently with late-model cars and low-octane gasolines. A vehicle study was conducted to gain a better understanding of the factors that influence after-run. Engine operating variables, such as high idle speed, lean idle mixture, and retarded basic spark timing, all increased after-run frequency by increasing the throttle opening (intake charge density). Reduced research-octane number of the gasoline also increased after-run frequency, but motor-octane number and hydrocarbon

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composition did not have any effect. After-run exhaust contained about 125 times more aldehydes than engine idle exhaust, and it caused eye irritation and an obnoxious odor. Compression ignition, rather than surface ignition, is most likely the cause of after-run.

Search terms: Dieseling; Exhaust gases; Idling; Fuel composition; Engine operating conditions; Air fuel ratio; Spark timing; Octane requirements; Exhaust composition; Ignition

AVAILABILITY: SAE

HS-010 691 Fld. 5/6; 5/11

SAVING MAINTENANCE DOLLARS WITH LEAD-FREE GASOLINE

by D. S. Gray; A. G. Azhari

American Oil Co.

1972 6p

Report no. SAE-720084

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Motorists who use lead-free rather than leaded gasolines postpone the need to replace spark plugs, exhaust systems, and carburetors, and thus save a significant part of their maintenance dollar. These savings were documented in a four-year test with a fleet of automobiles operated in city-suburban driving, and in a five-year survey of a representative sample of the motoring public. Savings on gasoline-related maintenance over the lifetime of an average car were about \$0.05/gal in the fleet tests and \$0.04/gal in the survey.

Search terms: Lead free gasoline; Automobile repair costs; Leaded gasoline; Vehicle maintenance; Road tests; Surveys

AVAILABILITY: SAE

5/10 Lighting Systems

HS-010 692 Fld. 5/10

SYSTEMS CONCEPTS IN INTER-VEHICULAR COMMUNICATION

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p44-7

The evolution of the present vehicle lighting system has not been systematic. Systems design concepts would consider the purposes and components of all the vehicle lights as communication devices. Candidate lighting systems should be evaluated from the systems viewpoint.

Search terms: Taillamps; Rear lamps; Systems analysis; Vehicle lighting; Headlamps; Turn signals

HS-010 693 Fld. 5/10

HEADLAMPS FOR THE FUTURE

by F. Woodward; K. R. Wolfe

Published in *Automobile Engineer* v67 n7 p42-5 (Jul 1971)

New sealed beam and tungsten halogen lamps for automobiles will produce more illumination of the road without increasing glare to oncoming or preceding vehicles. Recent developments include the widespread use of sealed beams in Europe, higher wattage filaments, and rectangular sealed beam units.

Search terms: Headlamp design; Headlamp glare; Sealed beam headlamps; Quartz halogen tungsten headlamps

HS-010 694 Fld. 5/10; 2/9

SENSING AND COMMUNICATION BETWEEN VEHICLES. INTRODUCTION

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p1-12

Four taillight systems were compared in tests using an instrumented car. An infrared sensing and communication system was tested. It was concluded that traffic volume could be substantially increased by the use of these devices.

Search terms: Taillamps; Traffic volume; Colored lamps; Driver aid systems; Passing; Sensors; Instrumented vehicles; Display systems; Highway communication; Infrared scanning

HS-010 695 Fld. 5/10; 2/9

TAILLIGHT SIGNAL SYSTEMS—DAYTIME STUDIES

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p12-24

Four taillight systems were evaluated for daytime car-following: NIL (no light), conventional, Tri-light, and Acceleration Information Display (AID). A series of eight braking, coasting, and acceleration maneuvers was performed and driver reaction time was studied.

Search terms: Driver aid systems; Driver reaction time; Acceleration; Braking; Taillamp daytime usage; Car following; Colored lamps

HS-010 696 Fld. 5/10; 2/9

TAILLIGHT SIGNAL SYSTEMS—NIGHTTIME STUDIES

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p24-9

5/6 Fuel Systems (Cont'd.)

HS-010 696 (Cont'd.)

Three taillight signal systems were evaluated for nighttime car-following: conventional, Tri-light, and Acceleration Information Display. Driver response times are compared. Aspects discussed include headway, average relative velocity, acceleration, and maximum relative velocity.

Search terms: Driver aid systems; Taillamps; Headways; Acceleration; Speed patterns; Night driving; Colored lamps; Car following; Driver reaction time

HS-010 697 Fld. 5/10; 2/9

VELOCITY DISPLAY SIGNAL SYSTEM

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p30-2

Effects on car following performance of a display mounted on the rear of the lead vehicle and displaying its velocity were studied. Two rows of green and one row of red lamps were used. Driver response time, speed patterns, and headways were studied in daytime conditions.

Search terms: Driver aid systems; Speed patterns; Display systems; Red lamps; Headways; Speed patterns; Green taillamps; Car following; Driver reaction time; Taillamp daytime usage

HS-010 698 Fld. 5/10; 3/4

INVESTIGATION OF USE OF TURN SIGNALS

by Thomas H. Rockwell; Joseph Treiterer

Published in HS-010 656, *Sensing and Communication Between Vehicles*, 1968 p53-62

5 refs

The limitations of turn signals as inter-vehicular communication systems were studied. The method employed was: observation of the frequency of turn signal usage at test sites under various conditions; relation of observed frequencies to elements of the driver-vehicle-road complex; and interpretation of results. Two general conclusions are: drivers use turn indicators in city driving more than in expressway driving; and signaling frequency increases with driver responsibility in both city and expressway driving.

Search terms: Turn signals; Driver behavior; Freeway driving; Signal usage; Urban intersections

5/14 Occupant Protection

HS-010 699 Fld. 5/14

OCCUPANT PROTECTION IN REAR-END COLLISIONS

by J. W. Melvin; J. H. McElhaney

Michigan Univ. Hwy. Safety Res. Inst.

1972 10p 9 refs
Report no. SAE-720033

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

This paper discusses the problem of occupant protection in severe rear-end collisions from the standpoint of high performance seat structures and head restraints. Consideration is given to both fixed head restraints and to deployable head restraints. Two-dimensional computer simulations of occupant kinematics in a variety of rear-end collisions are utilized to provide initial performance criteria for head restraint design configurations. The resulting prototype system underwent a test and development program on an impact sled. The

results of the various prototype performances and general criteria for high performance head restraint systems are discussed.

Search terms: Occupant protection; Rear end collisions; Head restraints; Restraint system tests; Computerized simulation; Occupant kinematics; Impact sleds; Seat design; Whiplash injuries; Human acceleration tolerances; Head protection; Head movement

AVAILABILITY: SAE

5/15 Propulsion Systems

HS-010 700 Fld. 5/15; 5/6; 5/18

A SURVEY OF PROPULSION SYSTEMS FOR LOW EMISSION URBAN VEHICLES. FINAL REPORT

by W. E. Fraize; R. K. Lay

Mitre Corp.

1970 120p refs
Contract AF-19628-68-C-0365
Report no. M70-45; PB-200 144;
UMTA-TRD-52-70-2

Propulsion systems suitable for low emission urban vehicles are described. The state-of-the-art of low emission systems is surveyed by direct contact with active development efforts in industry; the more promising areas for future development are reviewed. Exhaust emissions for fossil-fueled heat engines are summarized. A computer program was developed to demonstrate the effect of the various route cycle and vehicle parameters on required power and vehicle speed; results are presented for a typical small urban bus.

Search terms: Propulsion systems; Internal combustion engines; Urban automobiles; Vehicle dynamics; Buses; Speed patterns; Power output; Hybrid engines; Electric vehicles; Mechanical energy storage; Exhaust emissions; Flywheels; State of the art studies; Gas turbine engines; External combustion

engines; Rankine cycle engines; Stirling engines; Energy storage systems; Mathematical models

AVAILABILITY: NTIS

5/17 Safety Defect Control

HS-010 701 Fld. 5/17

PRODUCT LIABILITY AND MATERIAL FAILURES

by T. J. Dolan

Illinois Univ.

1971 10p 13 refs
Report no. SAE-710710

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

Personal injuries resulting from the failure of a product in service often subject the manufacturer to severe legal liability. Legally, every engineer and manufacturer owes a duty to all others to guard against injury which may occur in any foreseeable uses of his product; if injury results, a court may ultimately find the product to be defective. The safety and reliability of all products demand improved methods and procedures for material selection, design, fabrication, prototype evaluation, and proper maintenance. In addition to using considerable ingenuity in foreseeing all possible conditions of operation in the use of his product, the engineer must make a critical appraisal of all possible failure modes to which the product might be subjected. His goal should be logical approaches to prevention of failure, rather than stereotyped applications of codes and specifications. Failure analyses and service failures should be studied.

Search terms: Manufacturers liability; Legal responsibility; Failure stress; Strict liability; Failures; Injury causes; Defective products

AVAILABILITY: SAE

5/18 Steering Control System

HS-010 702 Fld. 5/18

EFFECT OF DRY FRICTION UPON STEERING SYSTEM

by Atsushi Watari; Shigaku Kyo

Published in *Bulletin of the Society of Automotive Engineers of Japan* n3 p44-53 (Mar 1971)

5 refs

The motion of a vehicle is studied analytically, considering dry friction in the steering system and disregarding the effect of roll. The analytical result shows the existence of stable and unstable limit cycles in the steady motion. Furthermore, the effect of dry friction, viscous damping, and cruising speed upon the amplitude and the frequency of stable limit cycle is investigated simultaneously.

Search terms: Motion effects; Vehicle stability; High speed; Velocity; Equations of motion; Friction; Steering; Mathematical analysis; Vehicle control; Damping; Roll; Wave damping

HS-010 703 Fld. 5/18; 4/7; 5/20

POWER TRAIN-VEHICLE MODELING TO SIMULATE SHIFTING TRANSIENTS OF OFF-HIGHWAY VEHICLES

by Larry G. Koch

Caterpillar Tractor Co.

1972 16p 8 refs
Report no. SAE-720044

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Analytic modeling and analog computer simulation techniques are presented for determining power train transient responses excited by clutch-actuated gear shifts. A method for describing the dynamics of a transmission arrangement

having several clutches and interconnected planetary gear sets is considered in detail. Simulation model testing is directed toward optimizing system design parameters and evaluating power train component capability and vehicle shift-feel. Data reduction techniques applied to model responses of torque and speed will yield appropriate spectrums representative of simulated work cycle. The spectrum data are used to predict hours of life for gears, bearings, and driveshafts, according to cumulative fatigue damage theory.

Search terms: Power trains; Vehicle dynamics; Simulation models; Off the road vehicles; Mathematical models; Shift levers; Transmissions; Driveshafts; Planetary gear trains; Clutches; Computerized simulation; Vibration; Gears; Bearings; Torque; Service life; Fatigue life

AVAILABILITY: SAE

5/20 Trucks and Trailers

HS-010 704 Fld. 5/20

EXPERIMENTAL STRESS ANALYSIS SPEEDS SNOWMOBILE DESIGN

by J. Lindley Smith

Published in *Automotive Engineering* v79 n9 p68-72 (Sep 1971)

Experimental stress testing reduces vehicle development time and assures reliability. Brittle lacquer coating and strain gauges were used extensively on an experimental snowmobile chassis. Pistons and V-belt sheaves were also tested. The technique replaces or supplements endurance testing.

Search terms: Snowmobile design; Stress analysis; Strain gauges; Durability tests; Welds; Chassis design; Sheaves; Pistons

HS-010 705 Fld. 5/20

ARCTIC OPERATIONS WITH THE TWISTER TESTBED

by William R. Janowski

Lockheed Missiles and Space Corp.

1971 13p 6 refs
Report no. SAE-710715

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

The Twister testbed, an articulated 8 x 8 vehicle, was operated on the Alaskan North Slope for three weeks in March and April 1970. The trials indicated that Twister was capable of running over terrain typical to the North Slope at speeds three to five times faster than existing commercial vehicles. Twister's ride was substantially better when compared to existing vehicles. Although deep snow occasionally stopped the vehicle, the self-recovery capability permitted the accumulation of 800 miles of test operation, of which 500 miles were cross-country, without any need for assistance by another vehicle.

Search terms: Off the road vehicles; Articulated vehicles; Cold weather tests; Temperature endurance tests; Alaska

AVAILABILITY: SAE

5/22 Wheel Systems

HS-010 706 Fld. 5/22

AN INSTRUMENTATION SYSTEM FOR THE ANALYSIS OF THE FORCED VIBRATION CHARACTERISTICS OF STATIONARY AND ROLLING TYRES

by J. W. Dunn; B. Mills

Birmingham Univ. (England)

[1970] 38p 6 refs

System dynamic response in terms of mechanical mobility function has been applied to work on the dynamics of stationary tires. This paper describes the instrumentation system designed for the analysis of the forced vibration characteristics of auto tires in terms of their driving point mobility function, resonant frequencies, and flexural mode shapes, with the important condition that these properties can be measured when the tire is either stationary or rolling.

Search terms: Mathematical analysis; Tire mechanics; Tire properties; Vibration tests; Tire test equipment; Tire tests; Tire vibration; Vibration analysis; Measuring instruments

HS-010 707 Fld. 5/22

CAL TO BUILD HUGE TIRE TESTER PROVEN IN QUARTER SCALE MODEL

by William Flanagan

Published in *Automotive Engineering* v79 n9 p56-60 (Sep 1971)

A unique flat bed tire tester at Cornell Aeronautical Laboratory will permit dynamic tests at speeds up to 200 mph. This road simulator will be useful in vehicle dynamics studies. It meets needs for a flat surface, high speed, and rapid changes in relative positions of tire and road. The concept is that of an endless belt running on two drums.

Search terms: Dynamic tests; Tire force measurement; Tire test equipment; Road simulators; Vehicle dynamics; Tire road contact forces; High speed

HS-010 708 Fld. 5/22

MEASUREMENT OF WET CORNERING TRACTION OF TIRES

by A. G. Veith

Published in *Rubber Chemistry and Technology* v44 n4 p962-95 (Sep 1971)

23 refs

Presented at a meeting of the Division of Rubber Chemistry, American Chemical Society, Miami Beach, 27-30 Apr 1971.

The purpose of this paper is to describe a technique for measuring the cornering traction of tires in the free rolling condition. The need for this type of measurement, especially over a speed range of 30-60 mph, is emphasized, the test system is described, and representative data and test results are shown. The variability associated with wet traction testing is discussed, and efforts taken to reduce it are mentioned.

Search terms: Tire tests; Tire test equipment; Tire treads; Tire slip motion; Mathematical models; Tire force measurement; Tire traction; Cornering; Coefficient of friction; Lateral force; Tire rolling resistance; Wet road conditions; Tire road contact forces

HS-010 709 Fld. 5/22; 1/3

THE EXAMINATION OF TYRES INVOLVED IN ACCIDENTS

by R. J. Grogan

Published in *Journal of the Forensic Sciences Society* v9 p13-22 (Jul 1969)

5 refs

In most cases, tire damage results from an accident — rather than being the cause — or from neglect or abuse. Examination of tires, wheels, and tubes involved in accidents can yield useful evidence. Common tire failures involve cuts and penetrations, concussion damage, deflation damage, towing damage, dislodgement, lumps and bulges, bead breakage, skidding and aquaplaning, valves, and incorrect fitment.

Search terms: Tire failure caused accidents; Tire failures; Accident investigation; Accident causes; Tire wear; Tire characteristics; Tire cuts; Accident factors

HS-010 710 Fld. 5/22; 4/7

THEORETICAL STUDY OF THE EFFECT OF TRACTIVE AND BRAKING FORCES ON CORNERING CHARACTERISTICS OF TIRE

by Hideo Sakai

Published in *Bulletin of the Society of Automotive Engineers of Japan* n3 p64-74 (Mar 1971)

8 refs

By using a tire model which is rolling with a constant side slip angle and a constant slip ratio, the traction, braking force, side force, and self-aligning torque acting on the tire are expressed as functions of the side slip angle and slip ratio. Accordingly, the effect of tractive and braking forces on the side force and on self-aligning torque can be obtained. It is also confirmed that theoretical values coincide with experimental data.

Search terms: Tire brake force; Tire traction; Brake torque; Tire rolling resistance; Sideslip; Tire side forces; Tire slip motion; Tire force measurement; Mathematical models; Simulation models; Friction

NHTSA DOCUMENTS

NHTSA Contractors Reports

HS-800 525 Fld. 5/9; 4/5; 5/4

1971 ANNUAL REPORT. DEPARTMENT OF MOTOR VEHICLES TO U.S. DEPARTMENT OF TRANSPORTATION, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

by Wiley W. Godsey

District of Columbia Dept. of Motor Vehicles

1971 45p
Contract FH-11-7191
Report no. AR-2

Includes the 1970 Annual Report as an appendix.

This report is a summary of the activities conducted under a contract with the National Highway Traffic Safety Administration (NHTSA). Areas covered include the development of a means of using vehicle inspection programs in NHTSA compliance activities, particularly vehicle safety defect recall campaigns, and as a basis for traffic accident

studies. In this connection, a real time, on-line information retrieval system is being designed and implemented. The results of this study will be used in developing procedures to aid the various states in converting the inspection methods necessary to insure compliance with NHTSA safety standards with least possible expense and trouble.

Search terms: Vehicle inspection; Exhaust emission tests; Information retrieval; Recall campaigns; District of Columbia; Information system design; Annual reports; Vehicle identification numbers; Automotive parts; Inspection stations; Automatic vehicle identification; Safety standards compliance

AVAILABILITY: (Limited) NHTSA

U.S. DEPARTMENT OF TRANSPORTATION NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Research Institute, Office of Accident Investigation and Data Analysis

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